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EXAMINER	
PRINCE, JESSICA MARIE	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/541,732	COSMAN ET AL.	
	Examiner	Art Unit	
	JESSICA PRINCE	2482	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2010*.

2a)☒ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,11-15 and 18-20* is/are pending in the application.

4a) Of the above claim(s) *21-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,11-15 and 18-20* is/are rejected.

7)☒ Claim(s) *15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The examiner notes that the claim identifier for claim 1 is incorrect. Claim 1 should be identified as (amended).

Response to Arguments

Applicants arguments filed 11/03/2010 have been fully considered but they are not persuasive.

Regarding Applicants argument that, claim 1 recites that a coder selectively chooses between encoding with respect to the at least one short term reference block in the short term reference block buffer and the at least one long term reference block in the long term reference buffer based upon one or more factors examined at the time of encoding to improve one of compression, video quality, and a metric balancing compression and video quality. Since Fukuhara fails to disclose or suggest such a feature, withdrawal of the rejection of claim 1 and its associated dependent claims is requested.

The examiner respectfully disagrees. The claim does not define the factors that are being examined at the time of encoding, except that these factors improve compression, video quality. Fukuhara discloses to selecting the prediction mode with the lowest absolute error for encoding, which improves the image quality. Thus, Fukuhara discloses to examine a factor (absolute error) that improves video quality.

Regarding applicants argument that as discussed above, claim 7 recites that the one or more factors are used to selectively choose, for each at least one block being

encoded, between the at least one long term reference block and the at least one short term reference block. On the other hand, the comparison in step three of Fukuhara selects between standard motion compensation and block-partitioning motion compensation as a prediction method without regard for whether the selected method uses the data in the short-term frame memory, the data in the long-term frame memory, or some combination of the two memories. For these reasons, applicants again request withdrawal of the rejection of claim 7.

The examiner respectfully disagrees. In addition to Fukuhara teaching where the final prediction mode is selected by comparing the absolute error of step 1 and the absolute error of step 2 (C. Procedure of MC and fig. 8), Fukuhara discloses where with two FM's, we can improve prediction efficiency. The advantages of additional FM are the following. First, we can find more reference candidates including occluded regions, so a more efficient predictor can be selected. Second, because there exists some time difference between these FM's, it is easy to distinguish difference in motion of contents between FM's. This makes prediction content (object)-oriented, that means more accurate motion estimation for each object may be performed. Third, same a B-picture in MPEG, interpolative prediction from two FM's is allowed. It works as a kind of temporal interpolation filter, then prediction efficiency will be increased, see IV. Motion Estimation (ME) and Compensation MC). A. Time-Differential Frame memories. Therefore, it is clear to the examiner that the number of frame memories in the encoder (additional FM's) are taken in account (examined) when determining the final prediction mode with minimum error which yields better video quality of the image.

Regarding applicant's argument that the cited references fail to disclose or suggest choosing the long-term reference block as recited in claims 2 and 3, withdrawal of the rejection of these claims is again requested.

The examiner respectfully disagrees. Fukuhara discloses to select the prediction that yields the lowest error for the long and the short term memories for a reference frame, (see fig. 8). AAPA discloses when a connection used to transmit video data suffers a change in quality, the resulting decoding may produce very poor results. When the reference frame provides a poor quality reference, the decoding result declines rapidly. One technique to address is has been proposed is to retain multiple frames, [0007]. Since Fukuhara discloses selecting the lowest absolute error for long and short term memories for the reference frame and AAPA discloses the use of multiple frames when the connection to transmit video data is poor, it is clear to the examiner Fukuhara modified by AAPA teaches and fairly suggest selecting between the long and short term reference frame memories when the quality is poor, which reads upon the claimed limitation.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 19 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which

was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. Regarding claim 19, lines 2-3 recite the limitation... "a composite frame predicted from both the short frame memory and the long term frame memory" . The examiner is unable to find where in the instant disclosure, as originally filed, describes such a step where "the composite frame predicted from both the short frame memory and the long frame memory"

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 19 recites the limitation "the short frame memory" and "the long term frame memory in line 2-3 There is insufficient antecedent basis for this limitation in the claim.

6. Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. It is unclear to the examiner what is to be considered a short frame memory, and if the short frame memory is the same as a short term frame memory. As best understood by the examiner and for the purposes of applying prior art, the examiner interprets a short frame memory as a short term frame memory.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 4, 7,11, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al.,"Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Frame Memories.

Regarding **claim 1**, Fukuhara teaches A video encoder (fig. 4 element video source encoder) comprising: a coder (fig. 4 element VLC) for encoding vectors (fig. 4 element motion vector) to describe at least an image block with respect to at least a reference block (motion compensation is performed between the current code frame and a reference frame, see I. Introduction, line 7-8); a short term reference block buffer storing at least one short term reference block (one is a reference stored in short-term

frame memory (STFM), see I. Introduction, line 5-6; IV. Motion Estimation (ME) and Compensation (MC), and fig. 4 element STFM); and at least one long term reference block buffer storing at least one long term reference block (The other is a reference stored in long-term frame memory (LTFM), see I. Introduction, line 7-8; IV. Motion Estimation (ME) and Compensation (MC) and fig. 4 element LTFM); wherein the coder selectively chooses between encoding with respect to the at least one short term reference block in the short term reference block buffer and the at least one long term reference block in the long term reference buffer based upon one or more factors examined at the time of encoding to improve one of compression, video quality, and a metric balancing compression and video quality (Fukuhara teaches where motion estimation is performed for every MB with half-pel accuracy. Its search area is ± 15.5 pixels (lines). In Step 1, three predicted macroblocks are produced. They are PMB(S), PMB(L) and PMB(IP). In Fig. 6, "t" frame is the most recently encoded frame. "t" frame is read from STFM while "L" frame is read from LTFM. PMB(S) is predicted from "t-1" frame (STFM) and PMB(L) is predicted from “L” frame (LTFM). On the other hand, PMB(IP) is interpolation between PMB(S) and PMB(L). Frame data stored in LTFM is updated b every Nth frame. One of the three prediction modes is selected that gives the smallest prediction error. Fig. 8 shows the procedure of the MC method. In step 1, absolute error (AE) are calculated for all of the three prediction modes. They are AE_half(S), AE_half(L), and AE_inter. The minimum AE (AE_step1) is calculated for the decision of prediction mode with offset. Further, Fukuhara teaches In step 2, absolute errors are calculated for the 16 patterns (four BP's by four combinations). The prediction

mode which gives the minimum AE (AE_Step2) among 16 AE's is selected in Step 2. In Step 3, the final prediction mode is selected by comparing AE_step 1 and AE_Step 2, see C. Procedure of MC and fig. 8. The examiner notes that selecting the prediction mode with the lowest absolute errors for encoding improves image quality, which read upon the claimed limitation). Fukuhara does not explicitly disclose a reference block.

However, it would have been obvious to one of ordinary skill in the art to incorporate a reference block, since a frame is composed of macroblocks.

Regarding **claim 4**, Fukuhara does not explicitly disclose the encoder of claim 1, wherein the coder for encoding selectively chooses the at least one long term reference block to encode background data and selectively chooses a more recent reference block to encode foreground data.

However, Fukuhara teaches where the proposed MC utilizes a couple of forward reference frames. One is a reference frame stored in a short-term frame memory (FM) which is overwritten frame by frame. It is basically for the motion estimation of the moving objects. The other is a reference stored in long-term FM whose contents include the static objects or the moving object in the past. It is for the prediction of the background or the object occlusion, see IV. Motion Estimation (ME) and Compensation (MC). Note: the applicants' specification describes the background may be used for a substantial time period because of its static nature, while a foreground portion is motion compensated by a most recent or recently received frame. Since the applicant describes the background as having a static nature and the foreground as is motion

compensated by a most recent or recently received frame, it is clear to the examiner that the short-term (FM) of Fukuhara is used for motion estimation of the objects, (foreground) and overwritten frame by frame and the long-term (FM) is used for static objects (background), which reads upon the claimed limitation.

Regarding **claim 7**, Fukuhara teaches the encoder of claim 1, wherein the one or more factors examined at the time of encoding include one or more of: the encoder's expectation of distortion at a decoder, a number of frame buffers in the encoder, the size of frame buffers in the encoder, any feedback from the decoder, a history of changing data channel quality, and a history of the changing image region quality the one or more factors being used to selectively choose, for each at least one block being encoded, between the at least one long term reference block and the at least one short term reference block to improve one of compression, video quality and a metric balancing compression and video quality (Fukuhara teaches where the final prediction mode is selected by comparing the absolute error of step 1 and the absolute error of step 2, see C. Procedure of MC, and fig. 8. The examiner notes that the prediction mode with the minimum error selected yields better video quality of the image, which reads upon the claimed limitation. Further the examiner notes that claim 7 is a Markush group claim and the Fukuhara meets the limitation where the one faction includes video quality).

Regarding **claim 11**, Fukuhara teaches the encoder of claim 1, wherein the coder selectively chooses between coding using the at least one long term reference block (INTER coding) and using INTRA coding (fig. 8 element Intra/Inter Decision).

Regarding **claim 19**, Fukuhara teaches the encoder of claim I, wherein the at least one long term reference block comprises a composite frame predicted from both the short frame memory and the long term frame memory (fig.6).

Regarding **claim 20**, Fukuhara teaches the encoder (fig. 4) of claim 1, wherein the at least one long term reference block comprises a long term reference frame (fig. 6) and the coder encodes a frame on a block by block basis (see B. Block Partitioning MC (BPMC) and fig. 4).

Regarding claim 31, The encoder of claim 1, wherein the coder selectively chooses between encoding with respect to the at least one short term reference block in the short term reference block buffer and the at least one long term reference block in the long term reference buffer based upon one or more factors examined at the time of encoding to maximize one of compression, video quality, and a metric balancing compression and video quality (Fukuhara teaches where motion estimation is performed for every MB with half-pel accuracy. Its search area is ± 15.5 pixels (lines). In Step 1, three predicted macroblocks are produced. They are PMB(S), PMB(L) and PMB(IP). In Fig. 6, "t" frame is the most recently encoded frame. "t" frame is read from STFM while "L" frame is read from LTFM. PMB(S) is predicted from "t-1" frame (STFM) and PMB(L) is predicted from “L” frame (LTFM). On the other hand, PMB(IP) is interpolation between PMB(S) and PMB(L). Frame data stored in LTFM is updated b every Nth frame. One of the three prediction modes is selected that gives the smallest prediction error. Fig. 8 shows the procedure of the MC method. In step 1, absolute error (AE) are calculated for all of the three prediction modes. They are AE_half(S),

AE_half(L), and AE_inter. The minimum AE (AE_step1) is calculated for the decision of prediction mode with offset. Further, Fukuhara teaches In step 2, absolute errors are calculated for the 16 patterns (four BP's by four combinations). The prediction mode which gives the minimum AE (AE_Step2) among 16 AE's is selected in Step 2. In Step 3, the final prediction mode is selected by comparing AE_step 1 and AE_Step 2, see C. Procedure of MC and fig. 8. The examiner notes that selecting the prediction mode with the lowest absolute errors for encoding improves image quality, which read upon the claimed limitation). Fukuhara does not explicitly disclose a reference block.

However, it would have been obvious to one of ordinary skill in the art to incorporate a reference block, since a frame is composed of macroblocks.

4. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., "Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Frame Memories" in view of Applicants Admitted Prior Art (AAPA).

Regarding **claim 2**, Fukahara is silent in regards to the encoder of claim 1, wherein the coder for encoding selectively chooses the at least one long term reference block when a connection used by the video encoder changes to a lower quality.

However,Fukuhara discloses to select the encoding prediction that yields the lowest absolute error for the long and short term frame memories (see fig. 8), thus it is clear to the examiner that Fukuhara discloses to select between long and short term memory based on error.

AAPA discloses when a connection used to transmit video data suffers a change in quality, the resulting video decoding may produce very poor results. When the reference frame provides poor quality reference, the decoding results declines rapidly. One technique to address this has been proposed is to retain multiple frames, [0008]. Thus, incorporating the teachings of AAPA with Fukuhara now discloses to select between the long and short term frame memory when the connection used to transmit data suffers, which reads upon the claimed limitation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of AAPA with Fukuhara for providing improved image quality.

Regarding **claim 3**, see the rejection and analysis made for **claim 2**.

5. Claims 9, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., "Very Low Bit-Rate Video Coding with Block Portioning and Adaptive Selection of Two Time-Differential Memories" in view of Gu e“ al., US-7, 253, 831.

Regarding **claim 9**, Fukuhara teaches the encoder of claim 1, wherein the encoder comprises a long term reference block buffer (see fig. 4 element LTFM). Fukuhara is silent in regards to a plurality of reference block buffers.

However, Gu teaches an encoder (fig. 2) comprises a plurality of reference block buffers (see fig. 2 elements PM_0-PM_{m-1}).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Gu with Fukuhara for providing improved allocation of picture memory between short and long term memory.

Regarding **claim 14**, Fukuhara teaches the encoder of claim 1, wherein the at least one long term reference block buffer comprise a frame buffer (fig. 4), and the encoder coder selectively chooses between coding using the reference block (INTER coding) and using INTRA coding (see fig. 8 element Intra/Inter Decision).Fukuhara is silent in regards to multiple frame buffers.

However, Gu teaches an encoder (fig. 2) comprises a plurality of reference block buffers (Gu discloses where a see fig. 2 elements PM_0-PM_{m-1}).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Gu with Fukuhara for providing improved allocation of picture memory between short and long term memory.

Regarding **claim 18**, Fukuhara (modified by Gu) as a whole teaches everything as claimed above, see claim 14. In addition, Fukuhara teaches the encoder of claim 14, wherein the at least one long term reference block comprises a block in a region of interest (fig. 3, where it is disclosed four types of block partitioning. (STFM: short term frame memory/LTFM: long term frame memory). The examiner notes that the block is a region of interest, which reads upon the claimed limitation).

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., “Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Memories" in view of Liu et al., US-5, 398,079.

Regarding **claim 12**, Fukuhara teaches The encoder of claim 11, wherein the coder conducts a fractional pixel accuracy encoding (see C. Procedure of MC, step 1, and fig. 8 element AE_half(S) and AE_half(L)), by, determining, for the at least one long term reference block and on a fractional pixel grid. Fukuhara is silent in regards to original pixel positions including pixels that coincide with an actual pixel position; horizontally or vertically interpolated pixel positions including pixels that lie between two original pixel positions; and diagonally interpolated pixel positions.

However, Liu teaches where original pixel positions including pixels that coincide with an actual pixel position; horizontally or vertically interpolated pixel positions including pixels that lie between two original pixel position, and diagonally interpolated pixel position (col. 4 line 33-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Liu with Fukuhara for providing efficient pixel interpolation.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., “Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Memories" in view of Liu et al., US-5, 398,079 and

further in view of Zhang et al., "Video Coding with Optimal Inter/Intra-Mode Switching for Packet Loss Resilience"

Regarding **claim 13**, Fukuhara is silent in regards to the encoder of claim 12, wherein: first moments of the horizontally or vertically interpolated pixel positions and the diagonally interpolated pixel positions are calculated directly; and second moments of the horizontally or vertically interpolated pixel positions and the diagonally interpolated pixel positions are estimated.

However, Zhang teaches wherein: first moments of the horizontally or vertically interpolated pixel position and the diagonally interpolated pixel positions are calculated directly; and second moments of the horizontally or vertically interpolated pixel positions and the diagonally interpolated pixel positions are estimated (see III. Recursive Optimal Per-Pixel Estimate of Decoder Distortion).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Zhang with Fukuhara for improving image quality and encoding.

Allowable Subject Matter

8. Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: The present invention involves an encoder with the following novel features wherein the coder chooses between two types of INTER coding and the INTRA coding, the two types of INTER coding comprising coding using the at least one short term long term reference block (ST) and the at least one long term long term reference block (LT), and wherein; the coder computes moments for the INTRA coding and the ST block using a recursive optimal per pixel estimate treating elements of a previous block as a random variable; and the coder computes moments for the LT block using a recursive optimal per pixel estimate treating elements of a previous block as a random variable.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JESSICA PRINCE whose telephone number is (571)270-1821. The examiner can normally be reached on 7:30-5:00 EST Monday-Friday, Alt Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha D. Banks-Harold can be reached on (571) 272-7905. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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